PHILIPS

Applying inner source development in product line engineering

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April 19, 2011

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Overview

Background

- Philips Healthcare
- Funded EU projects
  - Software product lines & open source
- Inner source

Conclusion

Philips Healthcare

Imaging systems supporting medical diagnosis

- Extensive image processing
- Image storage
- Image exchange
- Image viewing

Different “modalities”:

- X-Ray, MRI, Ultrasound, PET …

Philips Healthcare increase of scope

- Moving to imaging support during intervention
  - Hearth catheterisation
  - Minimal invasive surgery
- Moving to cover the whole care cycle
  - Prevention, screening, diagnosis, treatment, management, surveillance

Philips Healthcare
Businesses and products

General X-ray

Cardio/Vascular X-ray

Ultrasound

Computed Tomography

Magnetic Resonance Imaging

Nuclear Medicine

Positron Emission Tomography

Radiation Therapy Planning

Cardiac and Monitoring Systems

Healthcare Informatics

Customer Services

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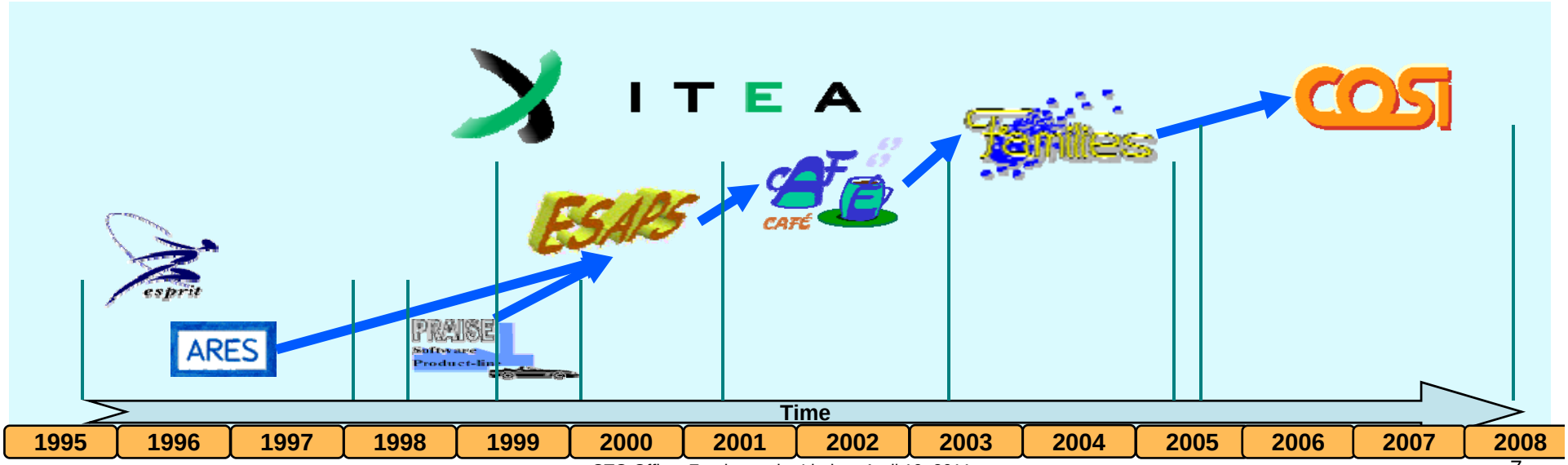
Funded EU projects

EU Esprit projects
- ARES & Praise (1995-2000)

ITEA projects
- ESAPS-CAFÉ-FAMILIES (1999-2005)
  - Introduction of product lines
- COSI (2005-2008)

  Co-development using inner & Open source in Software Intensive products
  - Open source development

13 years of European partnership projects
Total > 40 European partners



Why Software Product Line Development?

Business Drive

- Improve software production process
  - Learn from mechanical engineering technologies
- Fast generation of software
  - Software platform development
    - Managed reuse
- Fast production of variants
  - Software mass customisation
    - Managed variability

Software development improvement

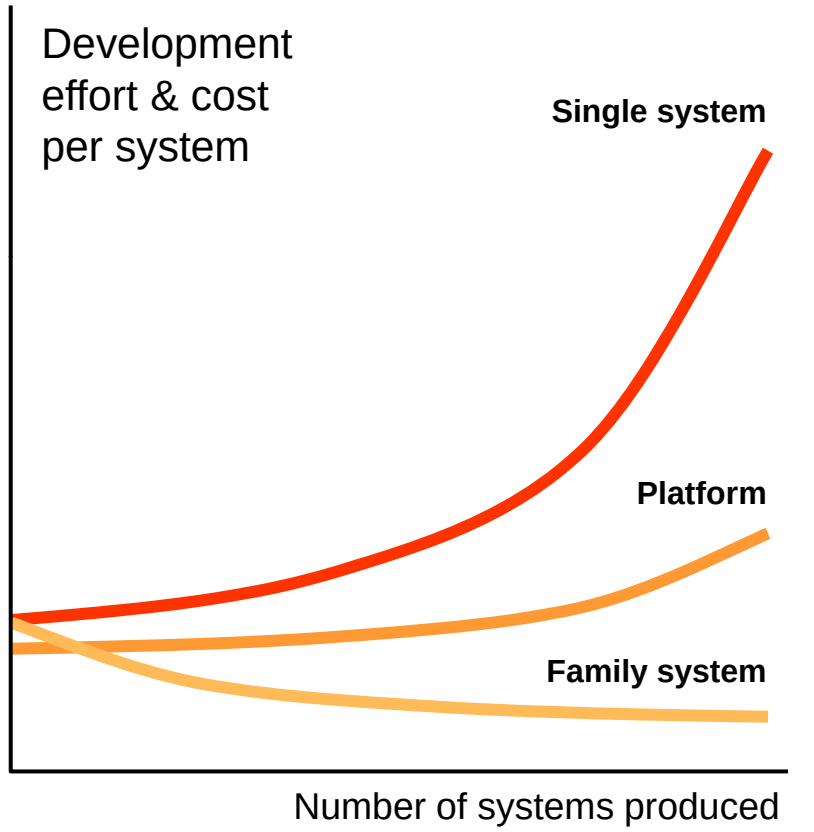
- Reduce development cost
- Reduce product lead-time
- Reduce maintenance
- Feature propagation
- Quality
- Common look-and-feel
- …

Managed reuse

- Variability management & platform

Product Line development experienced advantages

- Product cost reduction 60-70%
- Improved productivity
  - Factor 2-6 higher output
- Investment reduction
  - av. 50%, up to 90%
- Quality improvement
  - Product defect density < 50%
  - Reuse of test cases 40-60%
- Product lead-time reduction
- Ease of configuring
  - av. 50% faster, up to 95%
- Maintenance cost reduction
- Portfolio complexity reduction
  - av. 50% less components
  - Training time reduction



Data based on measurements by industrial partners in the projects

Product Line development in embedded systems

Product lines in embedded systems
- Since ~1990

Enable managed reuse and managed variability

Main elements

Two development processes

Explicit variability

Means
- Platforms

Explicit
- Variation model:
  - Variation points & variants
  - Configurations
- Decision support on variants

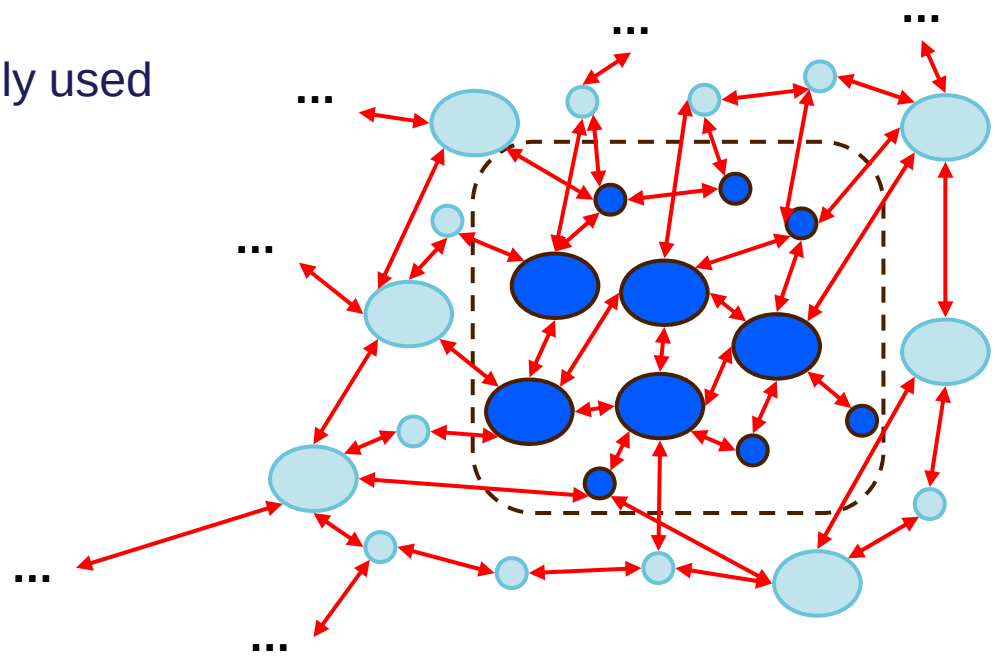
Distributed development: COSI

How to manage the complexity of heterogeneous distributed development

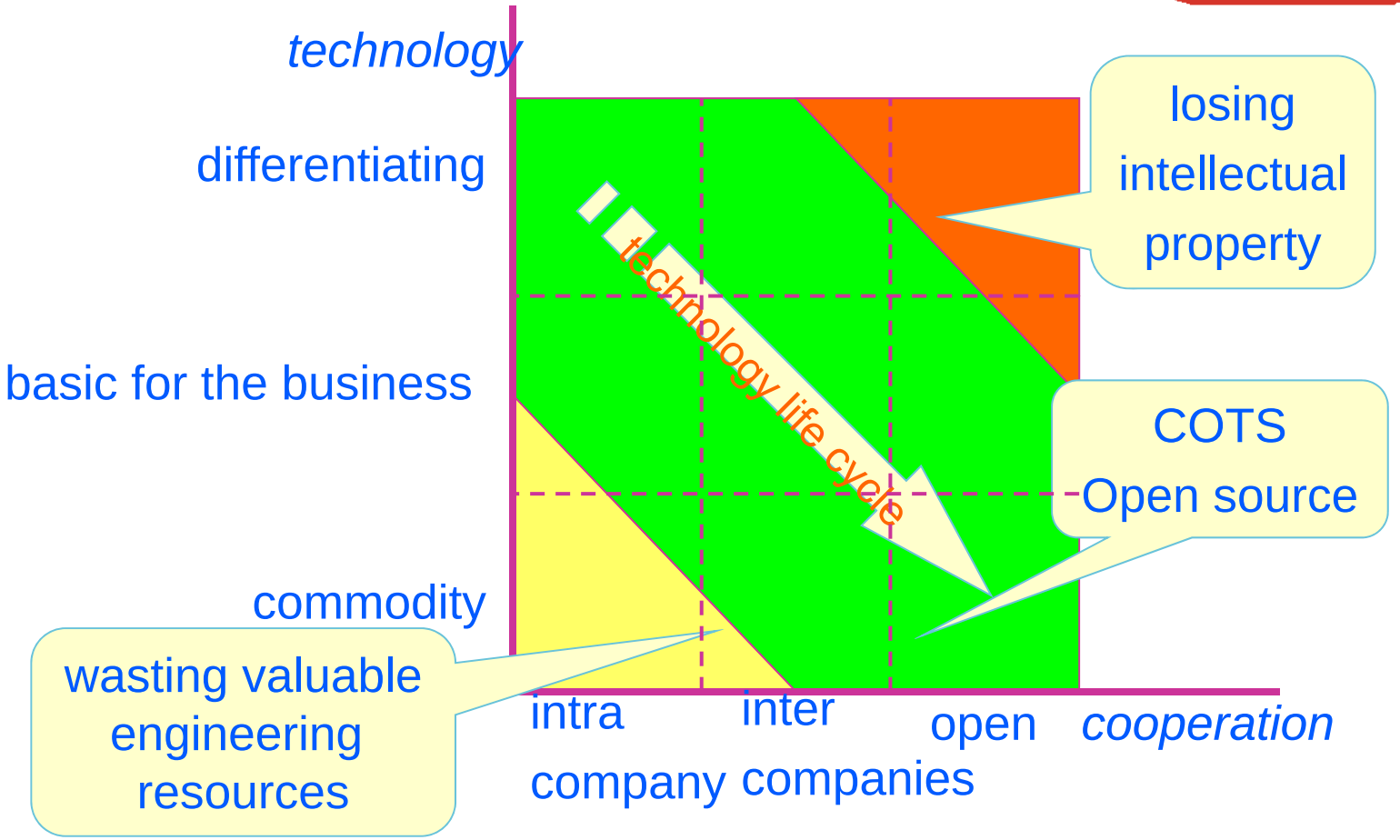
Challenges

- Large groups working on the same software
- Development groups are distributed
- Software shifts to commodity
- 3rd party software is increasingly used

COSI Consortium:
5 Industries
8 SME
2 Research institutes
4 Universities



Commodification of software



Software that was originally differentiating gets to be obtained as commodity

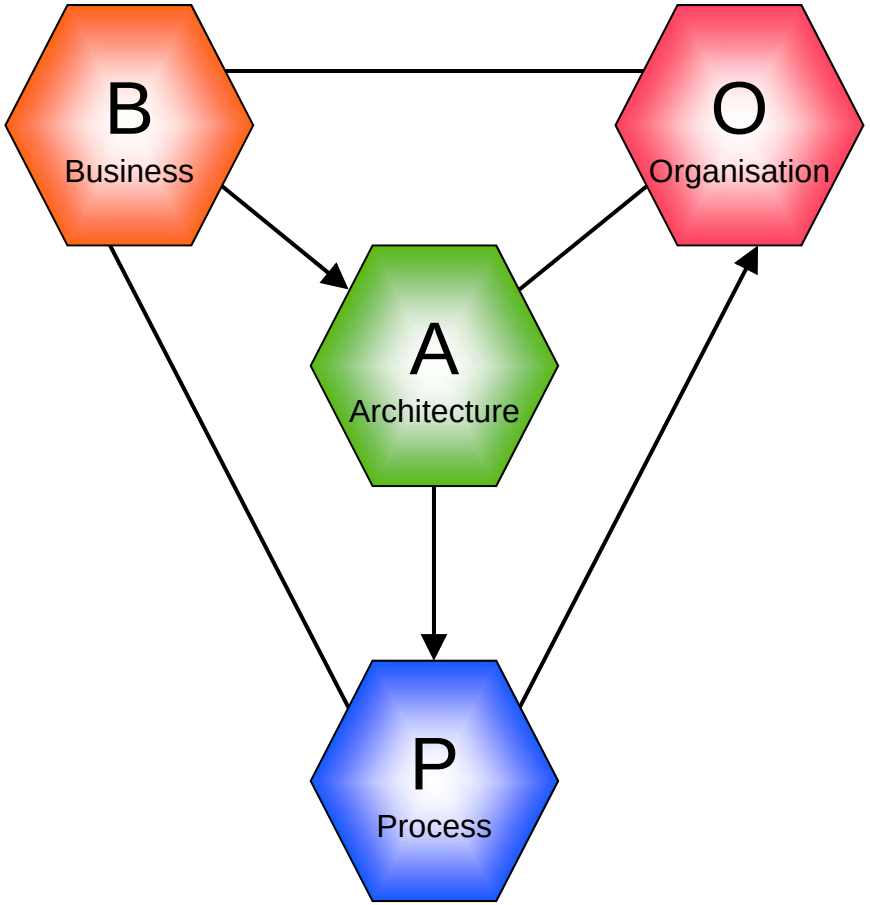
BAPO concerns of software engineering

Business
- Costs & profits, strategy, planning
  → Business Orientation

Architecture
- Technical means to build the software
  → Variability Management
  → Architecture-Centric Development

Process
- Roles, responsibilities & their relationships
  → Two-Lifecycle model

Organisation
- People & organisational structures
  → Two-Lifecycle model



Leveraging OS opportunities

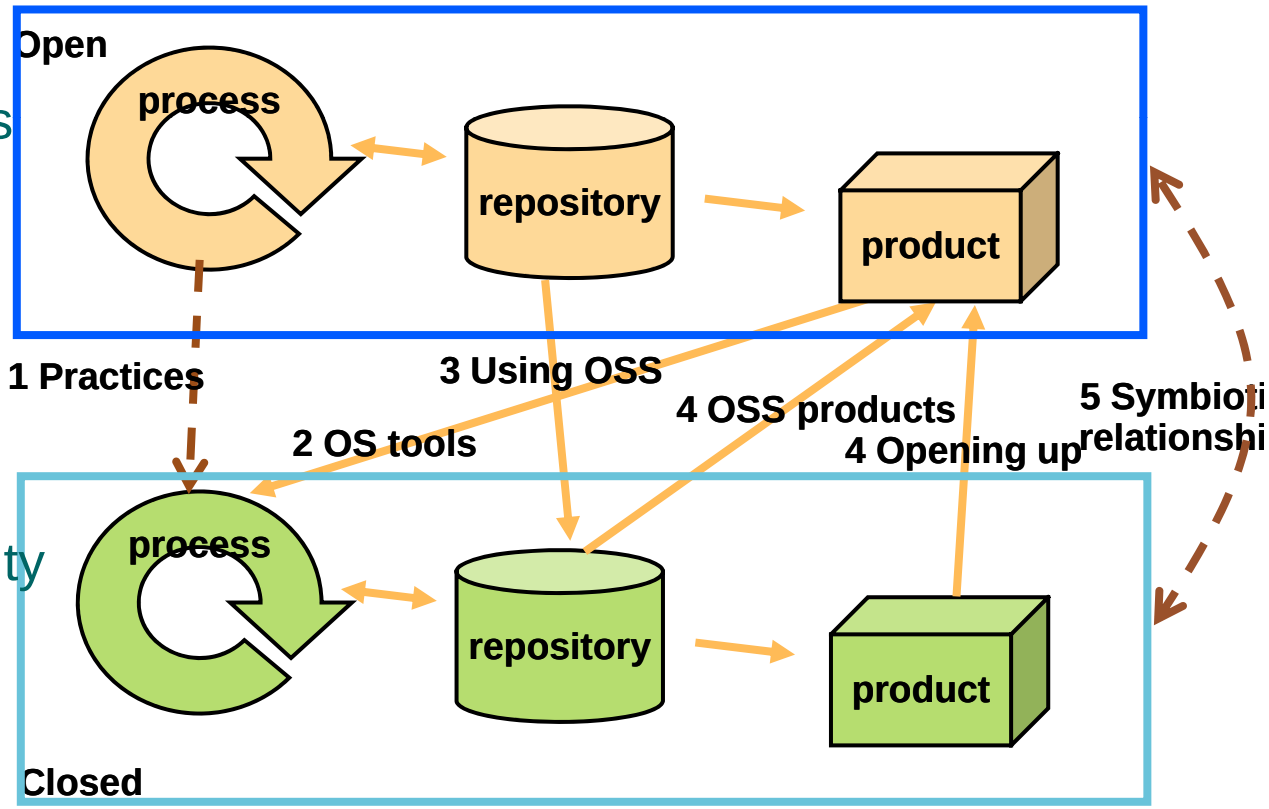
1 developing with OSS practices
→ inner source

2 using OSS tools
in developing products

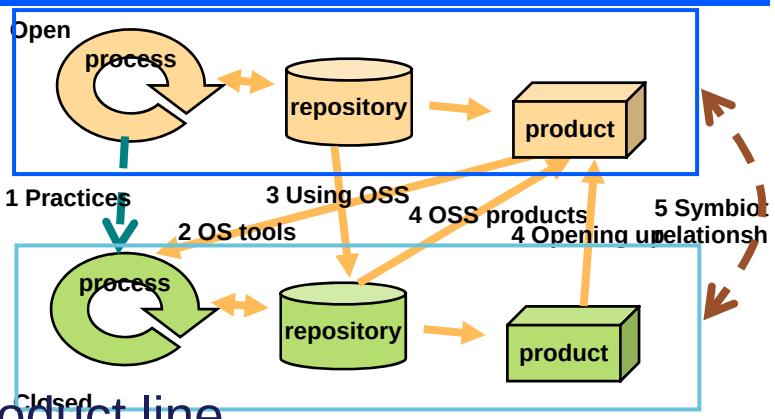
3 developing products
containing OSS

4 developing OSS
products

5 engaging and
leverage the community



Inner source

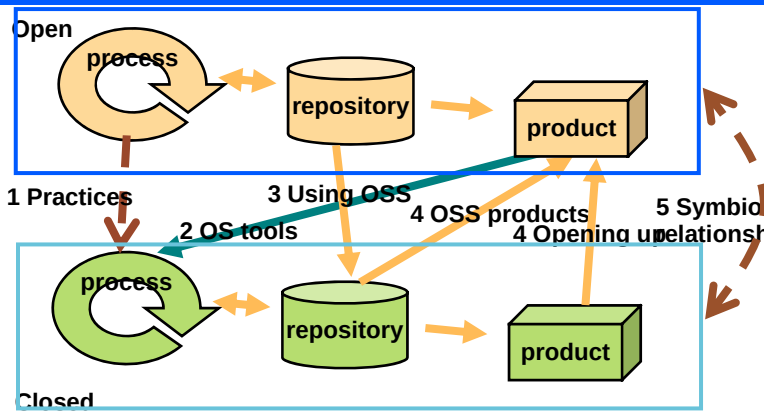


Exploit the OS distributed development advantages within a company
- Easy access to all information of the product line
- Release early and often
- Distributed ownership and control of domain assets
- Cooperative eco-system of development teams
- Avoid problems with planning, ownership and control

Use organisation mechanisms
- Escalation of conflicts
- Roadmaps

Results:
- Improved involvement of the application teams in the domain
- Improved platform use
- Reduced time-to-market

Using open source tools

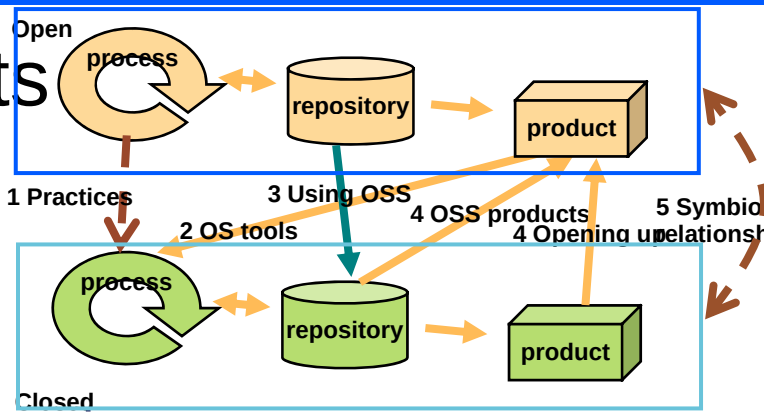


Open source software not in the final product
- Easy for the user to comply to licences
- Beware: for maintenance reasons tools may become part of product

Many open source tools already available
- Not many product line specific tools

Examples:
- Stylebase for Eclipse
  - reuse and sharing of architectural knowledge
- Subversion
  - version management
- Semantic MediaWiKi
  - support collaborative development

Using open source components



Similar to the use of 3rd party such as COTS

Planning of 3rd party software outside control

- Architecture compliance & interfaces is an issue
- Advanced knowledge is necessary

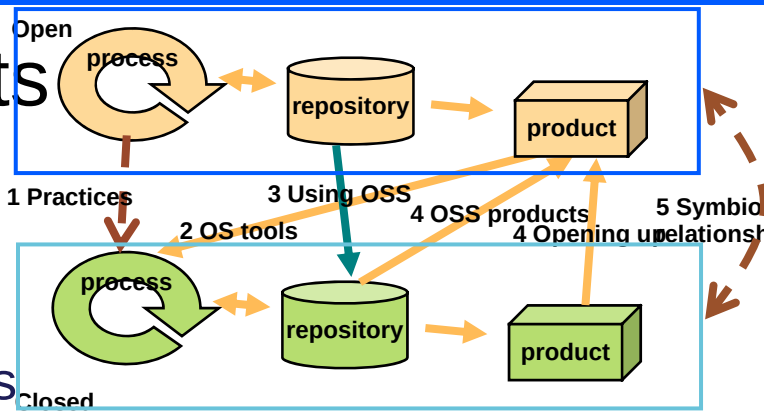
COTS

- Need good contacts with the supplier
- Disruptive releases

Open Source

- Involvement in the community
  - Leads also to (limited) control
- Continuous evolution
  - Fast incorporation is possible
  - Issuing bug reports and corrections keep open source at quality

Using open source components Product line issue



Open source in domain or application

- latest versions only in “trial” applications

Licensing: Communicated and managed

- Ignoring licenses may lead to consequences for other departments

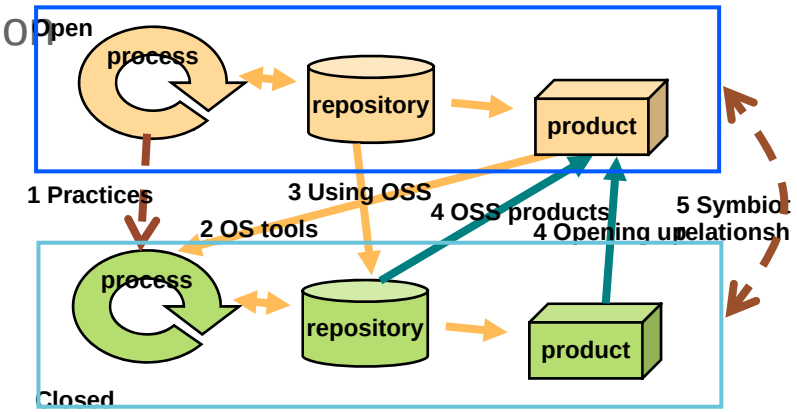
Open source use in application development indicate a move towards commodification

- → move to domain?

Opening up products of the product line

Commodity software can be shared

- Supporting a standard
  - Improve interoperability with competition
- Move to de-facto standard
  - Own products comply
  - Devalue propriety solution of a competitor
- Drive acceptance of the software
  - Visibility of the source
- Sharing maintenance
  - De-support strategy
- Enable the sales of something else
  - Services!
- Increase security, safety



Symbiotic relationship

Active involvement in community

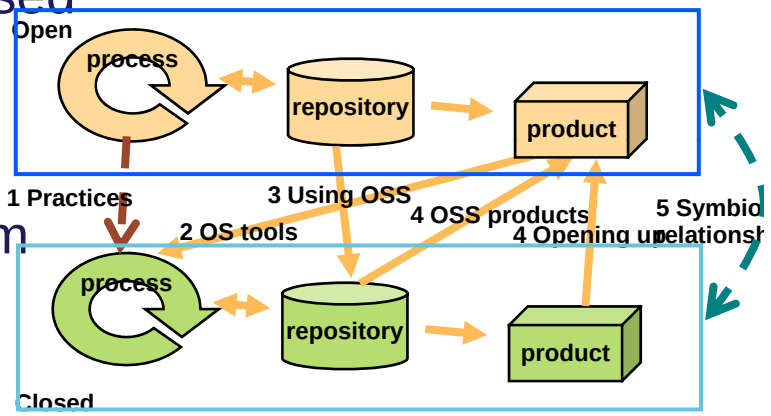
- Ensure that the right issues are addressed

Obtain improved components/tools

- Issue bug reports
- Donate software & patches solving them (partially)

Shared maintenance

- Software that is not maintained properly



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Philips Inner source

Development with open source practices

Philips experienced SPL Challenges:

- Growing platform adoption
  - Growing customer base
- High number of feature requests
  - Increasingly difficult to honour
- Products increasingly dependent on platform
  - Release schedules inherently misaligned
- R&D groups distributed across 3 continents
  - Communication more complex and cumbersome

Inner source: Why resolve bottleneck at domain engineering

Inspiration from OSS development:

Bring software engineers closer together

- Direct communication
- Platform knowledge sharing and exchange

Business units should also contribute to developing domain assets

- BUs are not dependent on the platform group
- Components are developed in the BU that has the best expertise

Background

Problems:

- Lack of Domain Expertise
- Stepwise deployment
- Alignment with (System) Product Roadmaps (priority setting)

InnerSource

- All groups contribute components based on their need and expertise

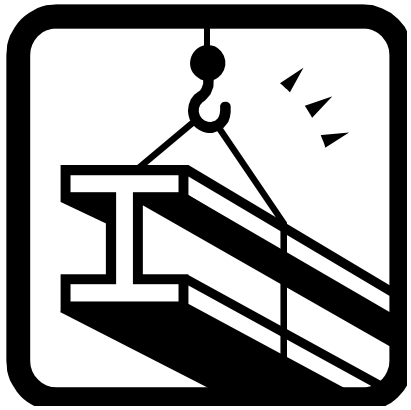
Inner source: What
Increase trust in platform

Improve feedback by being open

- Publish source code & relevant documentation
- Improved platform and product quality

Involve customers early

- Works-In-Progress (bimonthly)
- Snapshots (biweekly)
- Bleeding edge (instantaneous)
- Improved quality through early feedback
- Short time to market



Inner Source principles

Easy, but controlled, access
- All development information

Release early and often
- Flexibility
- Major (and minor) releases
- Snapshots & Bleeding edge

Distributed Ownership and Control
- The platform team owns and develops components
- The customer is allowed to change components,
  - Ownership rules

Patch
- Patches are improvements that may be offered back to the platform

Collaboration models

1. Use as is

   Use the platform unchanged

   \+ efficient

   – product team dependent on platform team

2. Patch

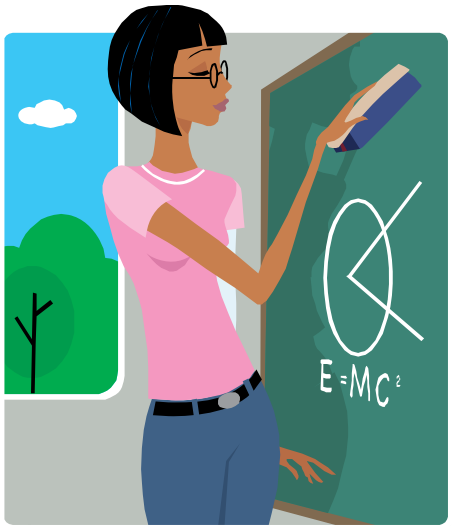
   Change some components

   Modifies the platform

   \+ flexibility for application engineering

   – inefficient: less re-use

Collaboration models



Contribute

- Change some components
- Offers change back
- \+ flexibility
- – re-use: contributions may need rework
- – does not work for big changes

Virtual team

- Application engineers temporarily join the domain engineering
- \+ flexibility and re-use
- \+ works for large scope
- ± must be managed well

Business aspects

Who pays for contributions by application engineering system-groups?

- Profit/loss responsibility
- Effort needed to make components re-useable

How to handle the maintenance and support?

- Contributing group gets maintenance/support obligations
- Role of the platform group

Internal Business Model

- encouraging active collaboration and contribution

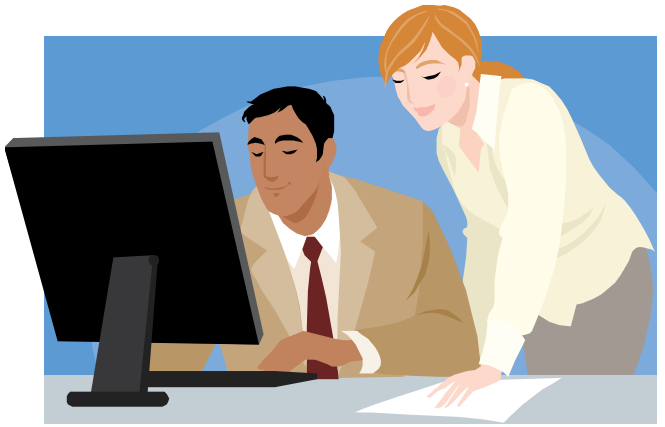
Necessary collaboration tooling support

Provide a scalable solution for global and inter-organizational collaboration

- Simplify development model
- Increase collaboration agility
- Reduce administration overhead
- Reduce merge overhead

Retaining the strong points of ClearCase

- Merge tracking
- Rename handling



Collaboration environment

Collab.net, Semantic Wiki & Subversion

- Mailing lists for support and technical discussions
- Document and file sharing
- Subversion for sharing source code
- Subversion for collaborating on new code

Staged introduction of the Collaboration environment

Experience with global collaboration

Much simplified development process

- Removed all unnecessary merging
- More flexible delivering (no serialization needed)

Lightweight: easy to learn,
minimal impact on other processes

Experiences openness

Openness/easy access to information:

- Support mailing lists successfully replaced the formal help desk
- More and earlier feedback improves quality and reduces lead time
- Document sharing through Wiki

Inner Source collaboration models:

- Patching supported by a simple add-on script

Size and health of the community

Percentage of the Philips SW community using the collaboration environment

- Steady growth
  - → over 1000 users of 1800 developers
- About 50% of users are active users (has been constant over time)

Results

Three times more product groups served

- Limited growth of the platform team

Substantially improved product quality

- Improved feedback from product groups
- Product groups find defects early

Significant time to market gains

- Product groups can start integrating earlier
- Product groups can provide features themselves

Growing and active Inner Source community

- Over 60% of the PH software community involved
- Many collaborations inside and outside Philips

Inner source
Conclusions

New environment boosted collaboration enormously

- Many collaborations running at any time
- More feedback
  → quality improvements and shorter lead time

Key functions

- Subversion (version control)
- Discussion services (mailing lists)
- Information sharing (Wiki, fixed documents less
- Role-based access and distributed project management

Inner source
Conclusions

The new environment is well adopted and liked

- Steadily growing user base; active discussion lists
- Low learning curve; engineers like the new environment
- Network performance (corporate proxies) is a bottleneck

Subversion:

- Enables large scale distributed development
- Drastically simplified platform development

Conclusions

Inner Source established within Philips Healthcare

- Detailed model underlying Inner Source
- Global collaboration infrastructure essential
- Adoption high and rising
- Inner Source helped break the platform bottleneck

Semantic Wiki established

- More people create documentation
- Wider variety of documentation created
- People are enthusiastic and keep coming back
- Less “trivial” questions on the support list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